

Form PTO-1590

U.S. DEPARTMENT OF COMMERCE  
PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

P20572

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371U.S. APPLICATION NO. (If known, see 37 CFR  
1.5)**09/744951**

INTERNATIONAL APPLICATION NO.

PCT/KR99/00437

INTERNATIONAL FILING DATE

5 August 1999

PRIORITY DATE CLAIMED

6 August 1998

TITLE OF INVENTION

ULTRAMINIATURIZED RESERVE BATTERY CELL

APPLICANT(S) FOR DO/EO/US

Won-Bac LEE, Han CHUNG, and Ho-Jun LEE

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information.

1. ☒ This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☒ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☒ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371 (c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☐ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).  
"Unexecuted"
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (U.S.C. 371(c)(5)).

**Items 11 to 16 below concern other document(s) or information included:**

11. Assignee: SEJU ENGINEERING CO., LTD. of Taejeon, KOREA
12. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
13. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
14. ☒ A FIRST preliminary amendment.  
☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☒ Figure of Drawing to be published ☐ 1A ☐
18. ☒ Other items or information:  
Cover Sheet and International Application as published in Japanese.  
PCT/RO/101-PCT Request(in Japanese).  
PCT/IPEA/409(in Japanese).  
PCT/IB/306.  
PCT/IB/308.  
PCT/ISA/210(in English and Japanese).  
Cover Letter under 35 USC 371 and 1.495.  
Claim of Priority.

U.S. APPLICATION NO. (If known, see 37 CFR 1.5) <div style="font-size: 2em; font-weight: bold; margin-left: 50px;">09/744951</div>		INTERNATIONAL APPLICATION NO. PCT/KR99/00437		ATTORNEY'S DOCKET NUMBER P20572					
19. The following fees are submitted: ~  Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search report has been prepared by the EPO or JPO. . . . . \$ 860.00 International preliminary examination fee paid to USPTO (37 CFR 1.482). . . . . \$ 690.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO(37 CFR 1.445(a)(2)). . . . . \$ 710.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2) paid to USPTO. . . . . \$1,000.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4). . . . . \$ 100.00  <div style="text-align: right;">ENTER APPROPRIATE BASIC FEE AMOUNT =</div>				<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:50%;">CALCULATIONS</th> <th style="width:50%;">PTO USE ONLY</th> </tr> <tr><td style="height: 100px;"></td><td></td></tr> </table>		CALCULATIONS	PTO USE ONLY		
CALCULATIONS	PTO USE ONLY								
Surcharge of \$130.00 for furnishing the oath or declaration later than ___ 20 ___ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$					
Claims	Number Filed	Number Extra	RATE						
Total Claims	13 - 20 =	0	X \$18.00	\$0.00					
Independent Claims	1 - 3 =	0	X \$80 00	\$0.00					
Multiple dependent claim(s) (if applicable)			+ \$270.00	\$0.00					
TOTAL OF ABOVE CALCULATIONS =				\$860.00					
___ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$					
SUBTOTAL =				\$860.00					
Processing fee of \$130.00 for furnishing the English translation later than ___ 20 ___ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				+					
Extension of Time fee in the amount of \$									
TOTAL NATIONAL FEE =				\$860.00					
Fee for recording the enclosed assignment (37 CFR 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+					
TOTAL FEES ENCLOSED =				\$860.00					
				Amount to be refunded	\$				
				Charged	\$				
a. <input checked="" type="checkbox"/> A check in the amount of \$860.00 to cover the above fees is enclosed. b. ___ Please charge my Deposit Account No. ___ in the amount of \$___ to cover the above fees. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-0089.  NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.  <div style="display: flex; justify-content: space-between;"> <div style="width: 60%;">           SEND ALL CORRESPONDENCE TO CUSTOMER NO. 7055            AT THE PRESENT ADDRESS OF:            Bruce H. Bernstein            GREENBLUM &amp; BERNSTEIN, P.L.C.            1941 Roland Clarke Place            Reston, VA 20191            (703) 716-1191         </div> <div style="width: 35%; text-align: right;"> <div style="font-family: cursive; font-size: 1.2em; margin-bottom: 5px;">Leslie Paperna Rayle</div>           SIGNATURE            Bruce H. Bernstein            NAME  <div style="border-bottom: 1px solid black; display: inline-block; width: 150px; margin-top: 5px;">29,027</div>            REGISTRATION NUMBER         </div> </div>									

P20572.A01

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Won-Bae LEE et al.  
Serial No : Not Yet Assigned (National Stage of PCT/KR/00437)  
Filed : Concurrently Herewith (International Filing Date August 5, 1999)  
For : ULTRAMINIATURIZED RESERVE BATTERY CELL

**PRELIMINARY AMENDMENT**

Commissioner of Patents and Trademarks  
Washington, D.C. 20231

Sir:

Prior to calculation of the filing fees and the examination of the above-identified patent application on the merits, the Examiner is respectfully requested to amend the claims as follows:

IN THE CLAIMS

Please amend the claims as follows:

Claim 7, lines 1 and 2, change "any one of claims 2 to 6" to ---claim 2---.

Claim 8, lines 1 and 2, change "any one of claims 4 to 6" to ---claim 4---.

Claim 10, lines 1 and 2, change "any one of claims 1 to 6" to ---claim 1---.

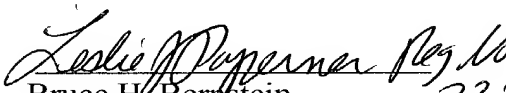
P20572.A01

REMARKS

By the above amendment, the claims have been amended to delete multiple dependency.

If there should be any questions, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,  
Won-Bae LEE et al.

  
Bruce H. Bernstein  
Reg. No. 29,027

33,329

February 6, 2001  
GREENBLUM & BERNSTEIN, P.L.C.  
1941 Roland Clarke Place  
Reston, VA 20191  
(703) 716-1191

P20572.A03

26 APR 2002  
09/744951

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Won-Bae LEE et al.

Group Art Unit : Unknown

Serial No : 09/774,951

(National Stage of PCT/KR/00437)

Examiner : Unknown

Filed : February 26, 2001

(International Filing Date August 5, 1999)

For : ULTRAMINIATURIZED RESERVE BATTERY CELL

PRELIMINARY AMENDMENT

Commissioner of Patents and Trademarks  
Washington, D.C. 20231

Sir:

Prior to examination of the above-identified patent application on the merits, entry of the following amendment is respectfully requested:

IN THE CLAIMS

Please amend claim 1 as follows, with a marked up copy of amended claim 1 being attached to this amendment:

1. (Amended) A reserve battery cell comprising:  
an electrolyte container for containing electrolyte;  
a reaction container connected to the electrolyte container for generating an electromotive force with the electrolyte provided by the electrolyte container upon reception

P20572.A03

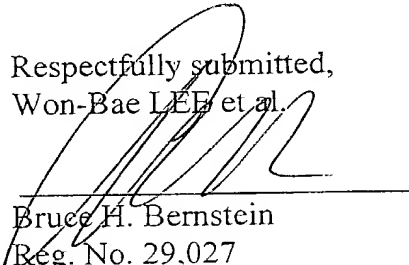
of an external impact, characterized in that the reaction container includes a separator spaced by the electrolyte container, the separator having a region composed of a first membrane of a relatively thinner thickness easily breakable upon reception of the external impact so as to lead the electrolyte into the reaction container.

REMARKS

By the above amendment, reference numerals have been removed from the claim. This amendment is not being made for purposes of patentability, but is merely being made to place the claim more in accordance with U.S. practice.

If there should be any questions, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,  
Won-Bae LEE et al.

  
\_\_\_\_\_  
Bruce H. Bernstein  
Reg. No. 29,027

May 7, 2001  
GREENBLUM & BERNSTEIN, P.L.C.  
1941 Roland Clarke Place  
Reston, VA 20191  
(703) 716-1191

P20572.A03

**Marked-Up Copy of Amended Claim 1**

1. A reserve battery cell comprising:  
an electrolyte container for containing electrolyte;  
a reaction container [29] connected to the electrolyte container for generating an electromotive force with the electrolyte provided by the electrolyte container upon reception of an external impact, characterized in that the reaction container includes a separator spaced by the electrolyte container, the separator having a region composed of a first membrane of a relatively thinner thickness easily breakable upon reception of the external impact so as to lead the electrolyte into the reaction container.

P20572.A07

09/744,951 04/26/01  
26 APR 2002  
09/744,951

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Won-Bae LEE et al.

Group Art Unit : Unknown

Serial No : 09/744,951

(National Stage of PCT/KR/00437)

Examiner : Unknown

Filed : February 26, 2001

(International Filing Date August 5, 1999)

For : ULTRAMINIATURIZED RESERVE BATTERY CELL

**RESUBMISSION OF PRELIMINARY AMENDMENT**

Commissioner of Patents and Trademarks  
Washington, D.C. 20231

Sir:

Applicants are hereby resubmitting this Preliminary Amendment to ensure that it is present in the file at the Patent and Trademark Office. In particular, it is noted that the incorrect Application No. was provided by the Patent and Trademark Office and this Application No. was placed upon the previously submitted Preliminary Amendment accompanied by the correct International Application No. Therefore, the Preliminary Amendment should be properly matched with the instant file. However, if it is placed in another file, the Patent and Trademark Office is respectfully requested to have the disclosure statement transferred to this file.

Prior to examination of the above-identified patent application on the merits, entry of the following amendment is respectfully requested:



IN THE CLAIMS

Please amend claim 1 as follows, with a marked up copy of amended claim 1 being attached to this amendment:

1. (Amended) A reserve battery cell comprising:  
an electrolyte container for containing electrolyte;  
a reaction container connected to the electrolyte container for generating an electromotive force with the electrolyte provided by the electrolyte container upon reception of an external impact, characterized in that the reaction container includes a separator spaced by the electrolyte container, the separator having a region composed of a first membrane of a relatively thinner thickness easily breakable upon reception of the external impact so as to lead the electrolyte into the reaction container.

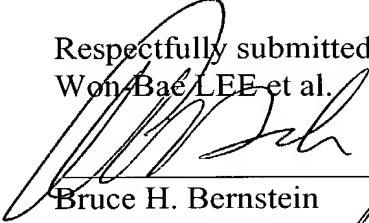
REMARKS

By the above amendment, reference numerals have been removed from the claim. This amendment is not being made for purposes of patentability, but is merely being made to place the claim more in accordance with U.S. practice.

P20572.A07

If there should be any questions, the Examiner is invited to contact the undersigned  
at the telephone number listed below.

Respectfully submitted,  
Won Bae LEE et al.

  
Bruce H. Bernstein  
Reg. No. 29,027

*Ex. 33,094*

May 7, 2001  
GREENBLUM & BERNSTEIN, P.L.C.  
1941 Roland Clarke Place  
Reston, VA 20191  
(703) 716-1191

**Marked-Up Copy of Amended Claim 1**

1. A reserve battery cell comprising:  
an electrolyte container for containing electrolyte;  
a reaction container [29] connected to the electrolyte container for generating an electromotive force with the electrolyte provided by the electrolyte container upon reception of an external impact, characterized in that the reaction container includes a separator spaced by the electrolyte container, the separator having a region composed of a first membrane of a relatively thinner thickness easily breakable upon reception of the external impact so as to lead the electrolyte into the reaction container.

P20572.A03



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09/744951/001  
amata  
2/8/02  
K. Park

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Won-Bae LEE et al.

Group Art Unit : Unknown

Serial No : 09/74,951

(National Stage of PCT/KR/00437)

Examiner : Unknown

Filed : February 26, 2001  
(International Filing Date August 5, 1999)

For : ULTRAMINIATURIZED RESERVE BATTERY CELL

**PRELIMINARY AMENDMENT**

Commissioner of Patents and Trademarks  
Washington, D.C. 20231

Sir:

Prior to examination of the above-identified patent application on the merits, entry of the following amendment is respectfully requested:

IN THE CLAIMS

Please amend claim 1 as follows, with a marked up copy of amended claim 1 being attached to this amendment:

1. (Amended) A reserve battery cell comprising:
- an electrolyte container for containing electrolyte;
- a reaction container connected to the electrolyte container for generating an electromotive force with the electrolyte provided by the electrolyte container upon reception

P20572.A03

of an external impact, characterized in that the reaction container includes a separator spaced by the electrolyte container, the separator having a region composed of a first membrane of a relatively thinner thickness easily breakable upon reception of the external impact so as to lead the electrolyte into the reaction container.

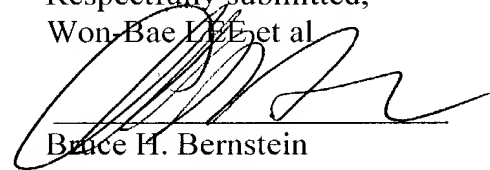
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REMARKS

By the above amendment, reference numerals have been removed from the claim. This amendment is not being made for purposes of patentability, but is merely being made to place the claim more in accordance with U.S. practice.

If there should be any questions, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,  
Won-Bae LEE et al



Bruce H. Bernstein  
Reg. No. 29,027

Hy no 33,094

May 7, 2001  
GREENBLUM & BERNSTEIN, P.L.C.  
1941 Roland Clarke Place  
Reston, VA 20191  
(703) 716-1191

**Marked-Up Copy of Amended Claim 1**

1. A reserve battery cell comprising:

an electrolyte container for containing electrolyte;

a reaction container [29] connected to the electrolyte container for generating an electromotive force with the electrolyte provided by the electrolyte container upon reception of an external impact, characterized in that the reaction container includes a separator spaced by the electrolyte container, the separator having a region composed of a first membrane of a relatively thinner thickness easily breakable upon reception of the external impact so as to lead the electrolyte into the reaction container.

09/744951

JC03 Rec'd PCT/PTO 06 FEB 2001

3/PAT  
ULTRAMINIATURIZED RESERVE BATTERY CELLTechnical Field

5 The present invention relates to a battery, and in particular, to a reserve battery cell activated to generate electric energy only when a user takes intentional actions.

In general, a battery comprises anode/cathode active materials and electrolyte generating electric energy by  
10 chemically reacting therewith. Unlike a primary/secondary battery, in which electrolyte is in contact with anode/cathode active materials under normal circumstances, a reserve battery initiates a role as a battery by mechanically breaking a separate closed container containing the electrolyte so that  
15 the electrolyte reacts with the active materials. Electrolyte is completely separated from the active materials in such a reserve battery cell. Thus, a reserve battery cell does not pose a problem of current leakage, unlike an ordinary battery cell, and can be retained for a long period of time. Moreover,  
20 the active materials and electrolyte of the reserve battery cell is very fresh at an initial stage of its usage, thereby creating no phenomenon of voltage retardation. For this reason, reserve battery cells occupy a major portion of the battery market as an emergency power supply or an energy  
25 source requiring a long retention period.

Background Art

In the conventional reserve battery cell, electrolyte is

generally retained in a ampoule made of glass. However, the glass ampoule can be manufactured to have a size at least longer than a centimeter with a thickness greater than hundreds of  $\mu$ . Further, the shape of the glass ampoule is limited to a cylindrical shape. Therefore, the conventional reserve battery cells can be manufactured at a large size only, and a relatively stronger power is required to mechanically destroy the ampoule. Hence, the conventional reserve battery cells have a drawback of being inapplicable to a small electronic system requiring activation of a super-slim battery with less power.

#### Summary of the Invention

It is, therefore, an object of the invention to provide a super-slim reserve battery cell applicable to a small electronic system and can be activated with a slight power.

To achieve the above and other objects, there is provided a reserve battery cell, comprising: a battery cell including a first electrode and a second electrode spaced by a separating member (the separating member is composed of a material absorbing electrolyte when the battery cell is activated); an electrolyte housing mounted on the battery cell for containing the electrolyte; a supporting member provided on a lower plate of the battery cell so as to be in electrical contact with the first electrode; a first sealing member composed of an insulating body for sealing side surfaces of the battery cell; a first membrane provided on a partial region of the



electrolyte housing contiguous with the battery cell and has a relatively thinner thickness than the electrolyte housing; and a membrane-breaking member for breaking the first membrane to lead the electrolyte into the battery cell.

5 To compliment the drawback of the conventional large-size reserve battery cell inapplicable to a small electronic system, the present invention realized a super-slim reserve battery cell sized merely several millimeters in its entirety including micro-size battery elements sized about several  $\mu\text{m}$   
10 by using a micro-machining technology of processing mechanical structures in a super-slim size. To be specific, the present invention realized electrolyte container and other battery elements by using materials such as silicon, nickel, copper, aluminum, etc. to form a membrane structure of relatively  
15 thinner thickness than the periphery in an electrolyte container contiguous with the battery cell that is broken only when activating the cell. Therefore, it is possible to activate the battery cell with less power while securing sufficient impact-resistant characteristics under normal  
20 circumstances.

#### Brief Description of the Drawings

The above and other objects, features and advantages of  
25 the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings, in which:

Figs. 1A and 1B are cross-sectional views of a super-slim

reserve battery cell in accordance with an embodiment of the present invention;

Figs. 2A and 2B are cross-sectional views of a reserve battery cell in accordance with another embodiment of the present invention; and

Figs. 3A and 3B are cross-sectional views of a reserve battery cell in accordance with another embodiment of the present invention.

Detailed Description of the Preferred Embodiments

Preferred embodiments of the present invention will be described herein below with reference to the accompanying drawings. In the following description, well-known functions or constructions are not described in detail since they would obscure the invention in unnecessary detail.

Figs. 1A and 1B are cross-sectional views of a super-slim reserve battery cell in accordance with an embodiment of the present invention. In particular, Fig. 1A illustrates an inert state of the reserve battery cell, while Fig. 1B illustrates an active state of the reserve battery cell.

Referring to Fig. 1A, an electrolyte container 11 containing electrolyte 10 is composed of a conductive material including silicon, nickel, copper, aluminum, stainless steel, etc. An electrolyte injection inlet 12 is formed on an upper plate of the electrolyte container 11. A membrane structure 11a is formed on a power portion of the electrolyte container 11, i.e., at a center of a reaction container 29 generating

electromotive force from the electrolyte 10.

Meanwhile, such a membrane structure is formed to be thinner than the contiguous lower plate by carving a part of the lower plate of the electrolyte container 11 with a micro-  
5 machining technology. Therefore, the membrane structure 11a may be composed of the same material as the lower plate of the electrolyte container 11. The electrolyte 10 is injected into the electrolyte container 11, and the injection inlet 12 is firmly sealed with a sealant 13 to retain the electrolyte 10  
10 for a long period of time. Materials chemically not reactive with the electrolyte 10, such as epoxy resin, plastic resin, indium, etc., are used for the sealant 13. An anode material 14 is mounted beneath the lower plate of the electrolyte container 11 except the portion occupied by the membrane  
15 structure 11a so as to be in electric contact with the lower plate. Cathode materials 15 are spaced by a separator 16, which is composed of a nonconductor that can absorb the electrolyte 10 such as non-woven glass fiber, paper, etc. A lower plate 17, which includes a membrane structure 17a of a  
20 slim thickness and is electrically connected to the cathode materials 15, is formed at the center of the lowest portion of the battery cell.

Meanwhile, a vacant space exists between the membrane structures 11a, 17a of the upper and lower portions of the  
25 lower plate 17. The lower plate 17 may be composed of any one material selected from silicon, nickel, copper, aluminum and stainless steel. The periphery of the battery cell is sealed with the sealant 18 such as epoxy resin so as to protect the

cathode materials 15 and the separator 16 from external environment. The battery cell shown in Fig. 1A is in inert state because the electrolyte 10 is separated from the electrodes 14, 15.

5 As shown in Fig. 1B, however, the central portion of the battery cell may be penetrated by an acute needle 19, depending on the user's will. Then, the needle 19 enters the battery cell by breaking the membrane structure 18a of the lower plate 17. If the needle 19 continuously breaks the  
10 membrane structure 11a of the lower plate of the electrolyte container 11, the electrolyte 10 is absorbed into the separator 16 to activate the battery cell. Since the penetration by the needle 19 is maintained while the battery cell is activated and in use, an external surface of the  
15 needle 19 should be composed of a nonconductive material. Moreover, in order to prevent leakage of the electrolyte 10 out of the battery cell, an O-ring 20 may be attached to the needle 19. Other devices than the O-ring 20 may be mounted on the needle 19 or a lower end of the battery cell to prevent  
20 leakage of the electrolyte.

According to an embodiment of the present invention, it is preferable to employ:  $\text{SOCl}_2$  solution for the electrolyte 10; lithium film of 0.05 thickness for the anode material 14; carbon (acetylene black) film of 0.2mm thickness for cathode  
25 materials 15; and non-woven glass fiber of 0.1mm thickness composed of glass fiber for the separator 16. It is also preferable to employ nickel of 0.1mm thickness for the electrolyte container with its cubic size being 5.0mm x 5.0mm

x 1.0mm. The injection inlet 12 has a diameter preferably of 0.5mm, and the membrane structure of the lower plate 17 of the electrolyte container 11 is designed to have a diameter preferably of 1.0mm and a thickness preferably of 5.0 $\mu$ m. The lower plate 17 generally composed of nickel has a thickness preferably of 0.1mm. The membrane structure 17a of the lower plate 17 is designed to have a diameter preferably of 1.0mm and a thickness preferably of 5.0 $\mu$ m. The needle 19 for breaking the membrane structures 11a, 17a is preferably composed of any one element selected from silicon, ceramic, glass, nickel, copper and aluminum. The needle 19 is designed to have a diameter preferably smaller than that of the membrane structures 11a, 17a. If a conductive material such as nickel, aluminum or copper is to be employed for the needle 19, nonconductive material is coated on the needle 19 to prevent short circuit between the two electrodes. The electrolyte container 11 and the lower plate 17 of a microstructure such as the membrane structures 11a, 17a can be manufactured by using the micro-machining technology.

Figs. 2A and 2B are cross-sectional views of a reserve battery cell in accordance with another embodiment of the present invention. The same drawing reference numerals as those in Figs. 1A and 1B were used in Figs. 2A and 2B for the identical elements. Fig. 2a illustrates an inert state of the reserve battery cell, while Fig. 2B illustrates an active state of the reserve battery cell.

Referring to Fig. 2A, the comprehensive structure of the battery cell is similar to that in Fig. 1A except that: no

membrane structure is formed on the lower plate 17; the upper plate of the electrolyte container 11 is formed to have a thickness less than 50 $\mu$ m so as to be slim and flexible; and the needle 19 is mounted on the central portion of the upper plate of the electrolyte container 11. Under an inert state of the battery cell, the needle 19 is slightly spaced from the membrane structure 11a of the lower plate of the electrolyte container 11, and is designed to have a smaller diameter than that of the membrane structure 11a.

As shown in Fig. 2B, if the central portion of the upper portion of the electrolyte container 11 is pressed by a stick 21, etc. according to the user's will, the membrane structure 11a of the lower plate of the electrolyte container 11 is broken to activate the battery cell. Since the upper plate of the electrolyte container 11 is flexible, the electrolyte container 11 is easily bent by even a slight power so that the needle 19 can break the membrane structure 11a of the lower plate of the electrolyte container 11. Also, the battery cell of this structure can be activated by an acceleration without any additional mechanical force such as pressure with a stick. In other words, the upper plate of the electrolyte 11 is bent by a force generated by an acceleration and a weight of the needle 19, and as a consequence, the needle 19 breaks the membrane structure 11a of the lower plate of the electrolyte container 11, thereby activating the battery cell.

Figs. 3A and 3B are cross-sectional views of a reserve battery cell in accordance with another embodiment of the present invention. The same drawing reference numerals as

those in Figs. 1A and 1B were used in Figs. 3A and 3B for the identical elements. Fig. 3A illustrates an inert state of the reserve battery cell, while Fig. 3B illustrates an active state of the reserve battery cell.

5 Referring to Fig. 3A, the comprehensive structure of the battery cell is similar to that in Fig. 1A except that the needle 19 is mounted on the flexible membrane structure 17a of the lower plate 17. If the central portion of the lower plate 17 is pressed by the stick 21, as shown in Fig. 3B, the needle  
10 19 breaks the membrane structure 11a of the lower plate of the electrolyte container 11 to activate the battery cell. Also, the battery cell of this structure can be activated by an acceleration without any additional mechanical force such as pressure with a stick.

15 The reserve battery cell according to other two embodiments of the present invention has an advantage of being dispensable with an additional device for preventing leakage of the electrolyte because the battery is activated without breaking an external surface thereof and no electrolyte is  
20 leaked outside as a consequence.

Further, the super-slim size of the reserve battery cell according to the present invention is suitable for an energy source of a small electronic system such as a sensor. The super-slim reserve battery cell according to the present  
25 invention also has a high impact resistance, and is easily activated by even a slight power.

While the invention has been shown and described with reference to certain preferred embodiments thereof, it will be

understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.

5       For instance, the above embodiments exemplified a case of setting the thickness of the membrane structure to be 5.0 $\mu$ m. However, the principle of the present invention is applicable to the case when the thickness of the membrane structure is less than 20 $\mu$ m. The technical principle of the present  
10       invention is also applicable to the case of switching the positions of the anode material and the cathode materials when necessary.



What Is Claimed Is:

1. A reserve battery cell comprising:  
an electrolyte container for containing electrolyte;  
5 a reaction container 29 connected to the electrolyte  
container for generating an electromotive force with the  
electrolyte provided by the electrolyte container upon  
reception of an external impact, characterized in that the  
reaction container includes a separator spaced by the  
10 electrolyte container, the separator having a region composed  
of a first membrane of a relatively thinner thickness easily  
breakable upon reception of the external impact so as to lead  
the electrolyte into the reaction container.

15 2. The reserve battery cell as recited in claim 1,  
further comprising a sealing member for sealing an electrolyte  
injection inlet provided on an upper surface of the  
electrolyte container.

20 3. The reserve battery cell as recited in claim 1,  
wherein the upper surface of the electrolyte container is  
flexible, and a member for breaking the first membrane is  
protruded toward the first membrane from an inner wall of the  
electrolyte container.

25 4. The reserve battery cell as recited in claim 1,  
wherein the separator of the reaction container has another  
region composed of a second membrane of a relatively thinner

thickness so as to face the first membrane.

5. The reserve battery cell as recited in claim 4, wherein the second membrane is flexible, and the member for breaking the first membrane is protruded toward the first membrane from an inner wall of the second membrane.

6. The reserve battery cell as recited in claim 4, wherein the member for breaking the first membrane is provided on an external surface of the reaction container and the electrolyte container for breaking the first and the second membranes upon reception of the external impact to activate the battery cell.

7. The reserve battery cell as recited in any one of claims 2 to 6, wherein the electrolyte container and the reaction container are respectively composed of any one element selected from silicon, nickel, copper, aluminum and stainless steel.

8. The reserve battery cell as recited in any one of claims 4 to 6, wherein the first and the second membranes have a thickness less than 20 $\mu$ m, respectively.

9. The reserve battery cell as recited in claim 3, wherein the upper surface of the electrolyte container has a thickness less than 50 $\mu$ m.

10. The reserve battery cell as recited in any one of claims 1 to 6, wherein the member for breaking the first membrane is composed of any one element selected from silicon, ceramic, glass, nickel coated with a nonconductive material, copper coated with a nonconductive material, and aluminum coated with a nonconductive material.

11. The reserve battery cell as recited in claim 10, wherein the member for breaking the first membrane is of a needle shape having a diameter smaller than the first membrane.

12. The reserve battery cell as recited in claim 1, wherein the reaction container comprises a separating member provided between a first electrode formed on an inner wall of the upper portion thereof and a second electrode formed on an inner wall of the lower portion thereof to electrically insulate the first and the second electrodes when no electrolyte is led in, and to generate an electromotive force from the electrolyte between the first and the second electrodes.

13. The reserve battery cell as recited in claim 12, wherein the separating member is composed of glass fiber or paper.

Abstract of the Disclosure

To compliment the drawback of the conventional large-size reserve battery cell inapplicable to a small electronic system, disclosed is a super-slim reserve battery cell sized merely several millimeters in its entirety including micro-size battery elements sized about several  $\mu\text{m}$  by using a micro-machining technology of processing mechanical structures in a super-slim size. The present invention realized electrolyte container and other battery elements by using materials such as silicon, nickel, copper, aluminum, etc. to form a membrane structure of relatively thinner thickness than the periphery in an electrolyte container contiguous with the battery cell that is broken only when activating the cell. Therefore, it is possible to activate the battery cell with less power while securing sufficient impact-resistant characteristics under normal circumstances.

FIG. 1A

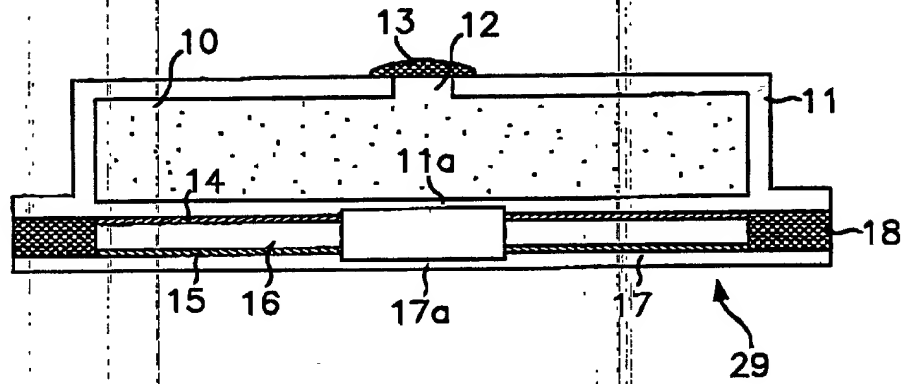


FIG. 1B

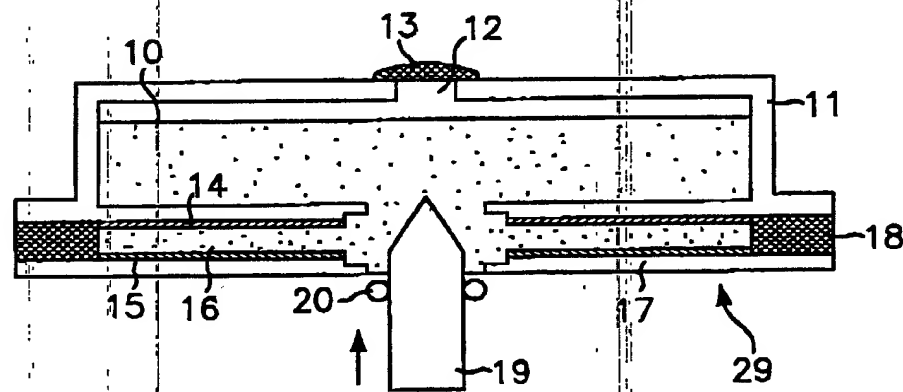


FIG. 2A

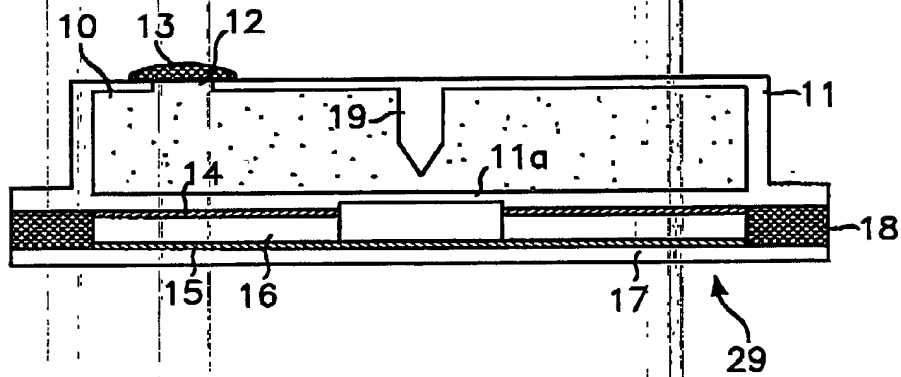


FIG. 2B

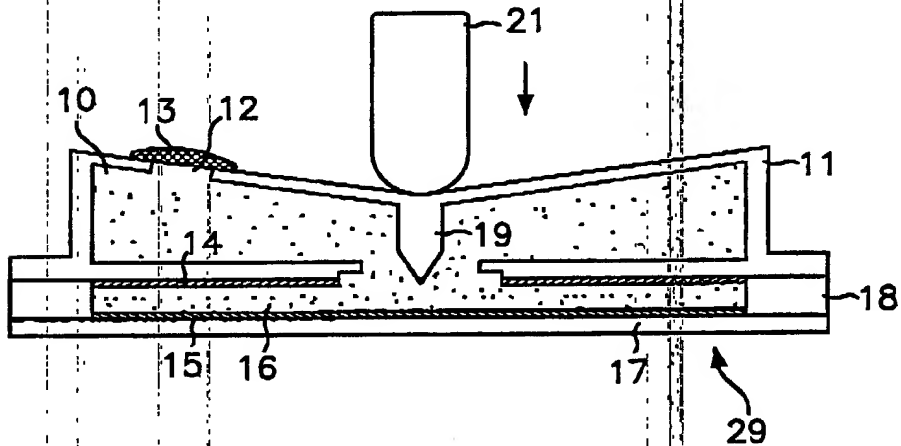


FIG. 3A

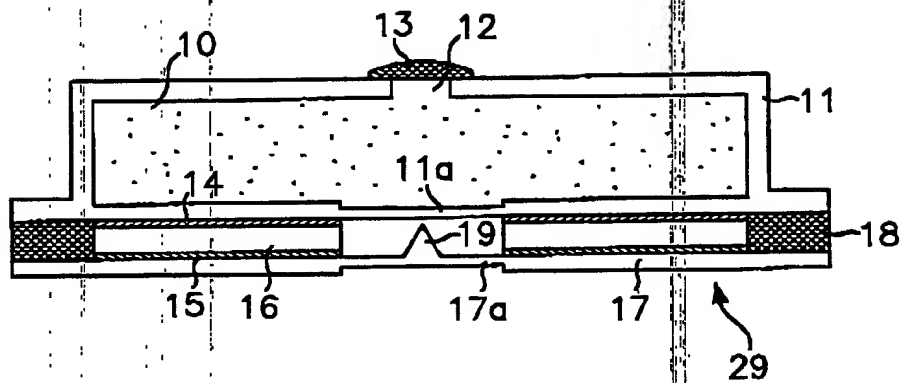
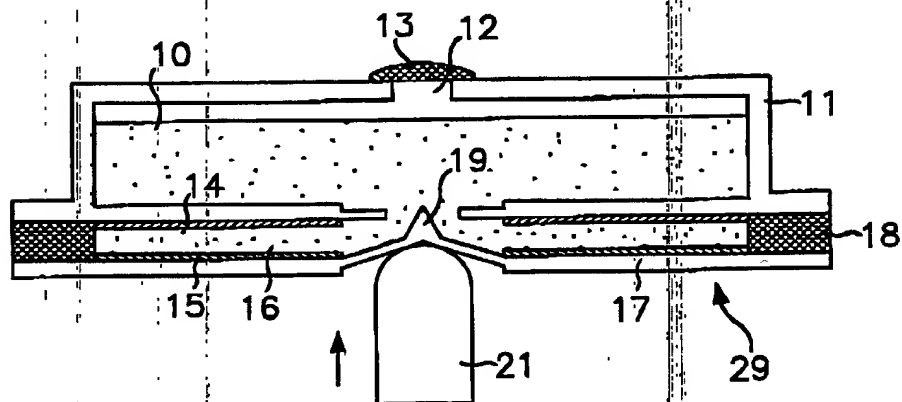


FIG. 3B



**Declaration and Power of Attorney For Utility or Design Patent Application**  
**English Language Declaration**

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

ULTRAMINIATURIZED RESERVE BATTERY CELL  
the specification of which is attached hereto unless the following box is checked:

☒ was filed on August 5, 1999 as  
United States Application Number 09/744,951  
and was amended on May 7, 2001 and February 6, 2001 (if applicable) or,  
PCT International Application Number PCT/KR99/00437  
and was amended on \_\_\_\_\_ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code §119 (a-d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below. I have also identified below, by checking the "No" box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed:

<u>1998/32068</u>	<u>Republic of Korea</u>	<u>6/August/1998</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
<u>          </u>	<u>          </u>	<u>          </u>	<input type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
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(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

☐ Additional foreign application numbers are listed on a supplemental priority sheet attached hereto.

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(Number)	(Day/Month/Year Filed)
(Number)	(Day/Month/Year Filed)

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I hereby claim the benefit under Title 35, United States Code §120 of any United States application(s), or §365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

(Application No.)

(Filing Date)

(Status)

(patented, pending, abandoned)

(Application No.)

(Filing Date)

(Status)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

The undersigned hereby authorizes the U.S. attorney or agent named herein to accept and follow instructions from either his foreign patent agent or corporate representative, if any, as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

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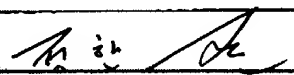
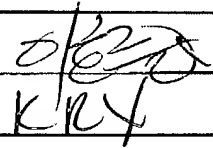
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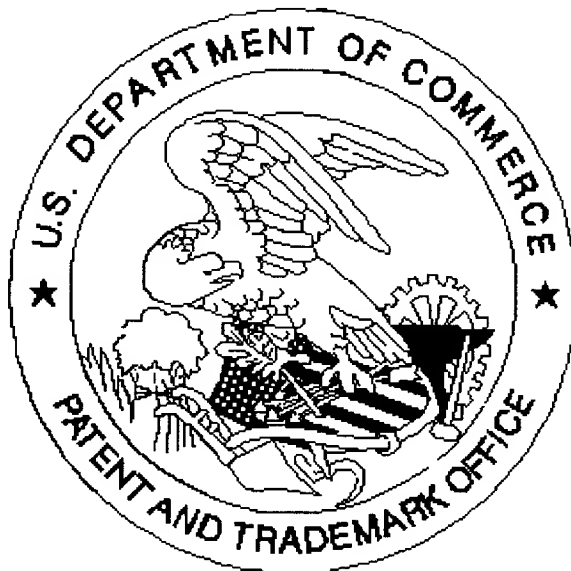
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